Wetland Delineation and Functional Assessment Report

For

Proposed West Bend Municipal Airport Expansion (SAP 0766-54-08)

And STH 33 Relocation (I.D. 1410-03-01)

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INTRODUCTION

The City of West Bend and the Wisconsin Department of Transportation (WisDOT) propose to expand the West Bend Municipal Airport and widen/relocate a portion of State Trunk Highway 33 (STH 33) in the vicinity of the airport in the Town of Trenton (U. S. Public Land Survey Township 11 North Range 20 East), Washington County, Wisconsin. Proposed airport expansion includes providing a 5,500-foot long primary runway, relocating STH 33 outside the Runway Safety Area and developing landside services to accommodate increased airport traffic. The proposed highway expansion proposes to widen approximately 2.5 miles of roadway from 2 to 4 lanes. This report summarizes the extent of wetland in the project area and assesses the functional values of these wetlands. By combining this information with the design of the proposed project one can minimize the loss of wetland functions and better understand the consequences of unavoidable wetland loss.

Coffman and Associates prepared a Preliminary Environmental Assessment (PEA) for this project under contract to WisDOT Bureau of Aeronautics. The PEA was approved by WisDOT and the Federal Highway Administration (FHWA) in April 2002. Part of the impact analysis for the PEA included wetland mapping and a wetland functional assessment conducted by Enviroscience in August 1997. Enviroscience based the wetland mapping on earlier maps and field surveys that examined primarily vegetation. Soil analysis was limited to that needed to determine only whether or not an area was wetland, and was not sufficient to determine accurate wetland boundaries. Hydrologic analysis was limited to observed hydrologic indicators at the time of the surveys.

For regulatory purposes, wetland determinations generally are assumed to be valid for five years, or less where hydrologic conditions have changed. Here, changes in land use, notably conversion from agricultural to residential land uses, and abandonment of agricultural lands, have caused changes both in vegetation and hydrology. Estimates of the extent of wetlands affected by various alternatives in project design require current accurate wetland boundaries. In addition, estimates of the effects of any wetland loss require an assessment of the functions that existing wetlands provide. Consequently, WisDOT requested that the Southeastern Wisconsin Regional Planning Commission (SEWRPC) and the Department of Natural Resources (DNR) update the earlier wetland report with current field-determined wetland boundaries and functional assessments. This report provides the wetland boundaries within the project area based on conditions in 2002-2003 and assesses the functional values of these wetlands. Functional values are based on field observations made during the boundary determinations and subsequent analysis of other available environmental data.

The METHODS section explains the field surveys, the features examined as part of a general map review and how these features describe the natural communities in the project area. The FUNCTIONAL ASSESSMENT section explains how these features, and additional project specific data, lead to wetland functional values. Appendix 1 includes a summary of the functional values, the plant species list for individual plant community areas, and the field data forms for all sampling points.

Review and analysis by several people contributed to the final functional assessment. Major contributors are listed at the end of this report.

METHODS

FIELD INVESTIGATION

WisDOT determined the project area, which includes land that may be disturbed as part of the Airport or Highway expansion, and which is shown on Figure 1. The east and west limits are the termini of the proposed STH 33 improvements. The north and south limits contain the proposed airport footprint. The footprint includes land area proposed for construction as well as for the clearing of vegetation for runway approach and safety.

Within the project area wetland-upland boundaries were determined and delineated with flags in the field by SEWRPC staff with assistance from DNR. All delineations followed the methods in *Basic Guide to Wisconsin's Wetlands and Their Boundaries* (Wisconsin Department of Administration, 1995) and are consistent with the 1987 U. S. Army Corps of Engineers Wetland Delineation Manual. Wetland delineations and surveys of wetland and upland plant communities began in the fall of 2002, continued through early winter until the soil was frozen, resumed in the spring, and were completed in June 2003.

SEWRPC noted the field-determined boundaries on orthophotos and WisDOT surveyed the flag locations. SEWRPC then transferred the surveyed locations to digital orthophotos and visually inspected the boundaries for accuracy. The digital orthophotos were obtained in the spring of 2000 with a 1 foot pixel resolution. Field maps used a scale of 1:4800 (1 inch = 400 feet). The minimum field mapping unit is about 0.1 acre.

Figure 1 shows the project area, field-delineated wetlands and the plant community area numbers assigned for this study. Table 1 includes two identification numbers. Those for this study (Plant Community ID, SEWRPC) correspond to the plant community area numbers on Figure 1. Identification numbers from the previous study (Plant Community ID, Coffman) allow for cross-referencing the results of both reports.

MAP REVIEW AND ANALYSIS

Additional data on factors related to wetland functional value were collected prior to developing wetland functional assessments. These factors are explained herein and, where they apply to individual wetland areas, are listed in Table 1. Each factor relates to one or more wetland functional values. The factors are used widely throughout the southeastern Wisconsin region, their categories are well defined and, except for Floristic Quality Assessment, their applicability is well tested and widely accepted. By using the same set of factors for each wetland, one can compare many sites within a project objectively and consistently. Their use also helps ensure the rankings in this assessment are comparable with those of other assessments in the same ecological region.

Wetland Area

Some wetland functions, such as water quality, depend on a wetland's position in the landscape, not just its area. This requires that an assessment consider the extent of the entire wetland or wetland complex independent of project area boundaries. Figure 1 also shows the approximate extent of wetland near the project area based on approximate surveys and the SEWRPC 2000 Land Use Maps.

Table 1 shows Wetland Area in terms of Wetland Acres. Wetland Acres is the number of wetland acres within the project area defined by WisDOT. A plus sign (+) indicates that the wetland extends beyond the limits of the project area

Advanced Identification (ADID)

The Advanced Identification (ADID) process is coordinated by the Environmental Protection Agency using the Section 404(b)(1) Guidelines (40CFR230.80), with the Army Corps and other partners, in areas where development or other pressures threaten high quality or locally critical wetlands. The purpose of ADID is to further wetland protection by providing science-based information on the values and functions of wetlands to those making local land-use decisions.

Within the project area ADID wetlands are those mapped wetlands that occur within the boundaries of the primary environmental corridor adopted in 1985. These are identified in Table 1.

An ADID study generally identifies wetland areas that are suitable or unsuitable for the discharge of dredged or fill material and serves as a preliminary indication of factors likely to be considered during review of a Section 404 permit application. At the Federal level, the classification is advisory. It does not constitute either a permit approval or denial and is intended only as a guide for community planners, landowners, and project proponents in planning future activities.

In Wisconsin, however, ADID wetlands are part of a special category of wetlands to be protected, "wetlands in areas of special natural resource interest" (NR 103.04, Wis. Adm. Code.) While wetland compensation may offset unavoidable wetland loss for some wetland types, this category recognizes that compensation is generally not effective for unique and significant wetlands. For this reason, NR 103 disallows consideration of compensatory mitigation for wetland functional values in decisions that affect wetlands in areas of special natural resource interest.

DNR and WisDOT have a separate wetland compensatory mitigation agreement. This agreement recognizes that the loss of ADID wetlands may be unavoidable in transportation projects, and that compensation has value even when it cannot fully replace wetland functions. Consequently Wisconsin recognizes compensation for ADID wetlands affected by transportation projects. Due to the significance of ADID wetlands, compensation for their loss generally is greater than it is for other wetland loss.

Environmental Corridor

Environmental corridors are roughly linear patterns on the natural landscape that contain the most important elements of the natural resource base in the region. In southeast Wisconsin corridors generally lie along major stream valleys, around major lakes and in the Kettle Moraine.

Inclusion in a primary or secondary environmental corridor is based on well-defined criteria established by SEWRPC (Rubin and Emmerich, 1981). Variables that contribute to the designation are size, length, width, and the presence of natural resource base elements such as woodlands; wetlands; wildlife habitat areas; surface water and associated undeveloped shorelands and floodplains; areas with steep topography or significant geologic formations; sites with significant scenic, historic or scientific value; groundwater discharge or recharge areas; and the best remaining park and open space sites.

Aside from the specific features they contain, corridors have an important role in the larger landscape. Corridors that link similar habitat patches mitigate the effects of habitat fragmentation by allowing migration and dispersal to encourage species diversity. The long-term persistence of species often depends on an organism's ability to reach an expanded suitable habitat. Corridors affect long distance dispersal for both plant and animal species since animals use corridors as travel lanes and incidentally distribute plant propagules. Keeping environmental corridors intact is the best way to maximize continuity and connectivity between habitat patches. The critical area and size depends on individual species, but generally maximizing interactions between habitat fragments through corridors is critical to maintaining regional biodiversity.

Since 1977 SEWRPC's adopted regional water quality management plans have recommended that primary environmental corridors be protected and preserved in essentially natural, open space use. Such protection and preservation is considered essential to the protection and wise use of the region's natural resource base, its cultural heritage and natural beauty that contribute to the quality of life. Protection and preservation is also essential to avoid new or increased environmental problems such as flooding, water pollution and loss of regional biodiversity.

In the Southeastern Wisconsin planning region primary environmental corridors account for about 17% of the land area or 468 square miles (SEWRPC, 1997). Of this area about half is already in or recommended for public ownership and half is recommended to be protected through appropriate local use controls.

Washington County adopted the existing environmental corridors shown in Figure 2 in 1997. These take into account 1990 land use data and the most recent floodplain analysis. Figure 2 also shows planned environmental corridors. Planned corridors are based on more recent land use data, including the wetlands identified in this study.

Many of the natural resource base features included in the primary environmental corridors are dynamic. Changing land uses and time contribute to the gain or loss of certain features such as woodlands and wetlands. The SEWRPC routinely accounts for such gains and losses on its most recent aerial photography. As new plans are prepared by the SEWRPC, the primary environmental corridors are refined to account for these changes. Upon adoption, after public review, of the new plan with its refined primary environmental corridors, the revised primary environmental corridors become adopted formally as well.

Natural Areas and Critical Species Habitat

Natural Areas and critical species habitat have been identified in *A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin* (SEWRPC, 1997). The purpose of the Plan is to identify significant areas and set protection priorities. Critical Species Habitats are those tracts of land or water that support Federal or State-listed rare, threatened and/or endangered plant or animal species. To distinguish natural areas of different quality the Plan classifies sites as Natural Areas of statewide, regional or local importance (NA-1, NA-2 or NA-3 areas respectively).

NA-1 areas contain excellent examples of nearly complete and relatively undisturbed plant and animal communities and are remnants of those present during pre-European settlement. NA-2 areas are similar but either more disturbed, of lower biotic quality or smaller than NA-1 areas. NA-3 areas are substantially altered by human activity but of local natural area significance. Typically NA-3 areas provide excellent wildlife habitat and provide refuge for a large number of native plant species that no longer exist in the surrounding area due to changes in land use.

Two Natural Areas, both Class NA-3, one Critical Species Habitat area, and one proposed Natural Area are in or near the project area and are shown on Figure 3. All areas are within a primary environmental corridor.

Poplar Road Lacustrine Forest is a 177-acre lowland hardwood swamp with a mosaic of upland islands and ephemeral ponds. It is the headwaters for two tributaries to the Milwaukee River. Past disturbance includes logging, trails and a corridor cleared for a power line at the west edge, all of which have contributed to the spread of exotic species especially common buckthorn (*Rhamnus cathartica*). The Plan recommends protection by a private conservancy organization.

Fellenz Hardwood Swamp, just south of the project area, is a 58-acre southern wet to wet-mesic hardwood forest located within the Milwaukee River floodplain. Disturbance includes selective cutting. The Swamp has many mature oaks and silver maples with a rich herbaceous layer and very few exotic species. An extensive heron rookery was documented in the early 1950's and a small colony remains. Ephemeral wetlands support a rich amphibian community. About 100 aces of former farmland adjacent to the Natural Area is part of a long term ecological restoration to expand the woodlands and establish native grassland plant communities. The entire area is protected by conservation easement in private ownership and is open to the public for hunting and passive recreational use.

The Cameron Property is an approximately 12-acre Critical Species Habitat area located to the northwest of the project area. This habitat area consists of fresh (wet) meadow, southern sedge meadow, shrub carr and second growth wet to wet-mesic lowland hardwoods with small stands of shallow marsh. The Cameron property is in private ownership.

Berth Woods is an approximately 13-acre southern mesic to wet-mesic hardwood stand in the Milwaukee River floodplain adjacent to Fellenz Hardwood Swamp. The woods is a wetland-upland complex with a nearly closed canopy of second growth and mixed age trees, a rich understory of spring ephemeral plant species, and very few non-native plant species. This site was identified during this study, subsequent to the Natural Area Plan, and is of NA-3 quality. SEWRPC will include amendments to Natural Area boundaries in subsequent Park and Open Space Plans and Land Use Plans for West Bend and environs.

Plant Community Type

Wetland plant community type is based on the classification in Eggers and Reed (1997). Each community type provides somewhat different wetland functions. The community types that occur in the project area are described below:

Fresh (wet) meadows are herbaceous plant communities dominated by grasses that are saturated all or part of the growing season but generally are not inundated with standing water. The dry periods allow vegetation to decompose and so fresh wet meadows typically occur with mineral rather than organic soils. Common plant species are the non-native redtop and reed canary grass and native forbs such as asters and goldenrods. The dense vegetation makes fresh wet meadows particularly important for water quality protection. Meadows are frequently pastured and provide wildlife habitat for many species including sandhill cranes, songbirds, deer, small mammals and their predators.

Sedge meadows are less common herbaceous plant communities in the southern part of Wisconsin as a consequence of conversion for agriculture. They are dominated by sedges in the genus *Carex*, along with bulrushes and spike rushes. Soils generally are saturated for longer periods than those of fresh wet meadows, so soils tend to be richer in organic material, and there is more opportunity for conversion of nitrates and ammonia to nitrogen gas. Wildlife use is similar to that of fresh wet meadows with the addition of more water dependent species such as amphibians and aquatic invertebrates.

Shallow marshes are emergent aquatic plant communities typically dominated by cattails, lake sedge, bulrushes and forbs such as arrowhead. They have permanent to seasonal shallow water typically up to six inches deep. Shallow marshes are feeding and breeding habitat for water birds, furbearers and fish, and winter habitat for upland species.

Shrub carrs are wetlands dominated by tall deciduous shrubs growing on saturated to seasonally flooded soils. Red-osier dogwood, silky dogwood and willow are common. The ground layer typically includes ferns, sedges, grasses and forbs of the sedge meadow and fresh wet meadow communities. Shrub carrs provide high value habitat for many songbirds, woodcock and small mammals. They also may be important winter habitat for pheasant, rabbit and deer.

Floodplain forests are mature lowland hardwood forest communities that occur on alluvial soils along large rivers, usually stream order three or higher (see page 7 for stream order definition). The areas flood periodically but are dry for much of the growing season. Canopy dominants include silver maple, green ash, swamp white oak and cottonwood. The shrub layer is typically sparse due to flooding. Floodplain forests are migration corridors and so harbor a wide variety of plant and animal species. Common species are wood ducks, owls, herons and a variety of songbirds. Pools within the forest support amphibians and invertebrates. Trees and shrubs in the river corridor provide woody debris and cover in the river that is important habitat for fish and other aquatic life.

Hardwood swamps are wooded wetlands with wet to wet-mesic deciduous hardwood trees. They are formed in old lakebeds or in relict river oxbows no longer subject to flooding, and are typically inundated in spring when ground water levels are high from winter rain and snowmelt. Soils are saturated throughout most of the growing season and vernal pools occur in depressions. Common tree species are black ash, red and silver maple, yellow birch, and American elm. Aspen is common after disturbance. The shrub layer is more developed than in a floodplain forest and occurs with ferns, sedges and grasses and forbs of the sedge meadow and fresh wet meadow communities. Soils are typically organic.

Calcareous fens are rare plant communities associated with an internal flow of groundwater rich in calcium and magnesium bicarbonates or calcium and magnesium sulfates. The mineral content causes a highly alkaline environment tolerated only by plants that are well adapted to these harsh conditions. Consequently, calcareous fens generally support species that do not occur elsewhere including a disproportionate number of rare species. The fen in the project area was created as a result of intercepting groundwater discharge during excavation. The fen area is small but it contributes to the overall diversity of the adjacent wetland.

Fresh (wet) meadows, sedge meadows, shrub carrs, and floodplain forests are by their nature seasonal wetlands. Hence, the Corps of Engineers' delineation manual characterizes them as "problem wetlands" from a delineation standpoint. In seasonal wetlands, the hydrology indicators may be absent during part of the growing season.

Plant Community Composition

The quality of a plant community depends on its species composition and structure. Individual species may be native or non-native. Native species also vary widely in the extent to which they persist with disturbance.

Floristic Quality Assessment is a standardized tool that uses plant community composition to gage the extent of disturbance and the degree to which a community is ecologically intact. Floyd Swink and Gerould Wilhelm (1994) developed the method for natural area assessment and first applied it in the Chicago Region. The method assigns a Coefficient of Conservatism, a whole number from zero to 10, to each native plant species based on that species' tolerance for disturbance and its fidelity to a particular pre-settlement plant community type. The aggregate conservatism of all the plants inhabiting a site may be used to estimate floristic quality.

Refer to Swink and Wilhelm (1994) for a thorough discussion of the assessment method, how Coefficients of Conservatism are assigned, and how to calculate a Floristic Quality Index. The Coefficients of Conservatism for all Wisconsin plant species have been proposed and are currently undergoing review (Bernthal, 2003). They are available from the Wisconsin State Herbarium website, http://www.botany.wisc.edu/herbarium/.

For each plant community area, Table 1 lists the number of native and non-native species, the mean Coefficient of Conservatism (C) and the Floristic Quality Index (FQI). Since each wetland was visited during only one season, and some only in winter, the plant species lists are incomplete and some FQI results in Table 1 are underestimates.

This report also considers additional ecological attributes of individual plant species. For example some species are more invasive and tend to outcompete and eventually eliminate others. Some tend to occur with specific environmental conditions, such as a particular water chemistry or hydroperiod, and so their occurrence is indirect evidence of these conditions. The plant species lists for each community identified on Figure 1 are in Appendix 1.

Stream Order

Stream order refers to the order of the stream to which a wetland drains or is adjacent. Stream order is a general way of describing the size of a stream or river. DNR uses the Strahler stream ordering system (Strahler 1964). The smallest permanent streams are called "first order". Two first order streams join to form a larger, second order stream; two second order streams join to form a third order, and so on. Smaller streams entering a higher-ordered stream do not change its order number.

Wetlands associated with different stream orders have different hydrologic regimes and therefore provide somewhat different wetland functions. Lower order streams have a greater interaction with adjacent land and a greater role in water quality. They also typically carry the coarse plant material and most organic carbon that is the base of the aquatic food chain. Higher order streams carry more total volume and so are more important in conveyance and supporting larger aquatic organisms.

Floodplain

The "100-year floodplain" is the land below the regional flood elevation regulated by Washington County, or the area inundated by the storm event with a 1 percent chance of occurrence in a given year. The floodplain includes the floodway, the area that carries flowing water, and the flood fringe, which is inundated with standing water, during a regional flood. Figure 4 shows the streams and the current floodplain and floodway in the project area.

Wildlife Habitat
Wildlife habitat areas remaining in the Southeastern Wisconsin Region were identified by SEWRPC and WDNR in 1988 and categorized as either Class I (High Value), Class II (Medium Value), or Class III (Good Value) habitat areas.

Class I wildlife habitat areas contain a diversity of habitat types, are large enough to meet all habitat requirements for the species concerned and are generally located near other wildlife habitat areas. Class II wildlife habitat areas generally lack one of the three Class I criteria, but retain a good plant and animal diversity. Class III wildlife habitat areas are remnant in nature and generally lack two or more of the Class I criteria. They do, however, have value due to their proximity to other habitat areas, as travel corridors between habitat areas or if they provide the only range in an area.

Classes were determined by considering a variety of wildlife habitat features including size, juxtaposition, structure, quality and the level of disturbance (SEWRPC, 1990). These features were interpreted from 1985 aerial photos and supplemented with field inspections. For this study the wildlife habitat classes were reviewed and modified so that the values listed in Table 1 reflect conditions at the time of the field surveys. Figure 3 shows Wildlife Habitat Areas.

The following factors apply generally to the project area wetlands but are not listed in Table 1.

Shoreland Zoning
Shoreland Zoning establishes statewide minimum standards in unincorporated areas to protect water quality, fish and wildlife habitat, recreation and natural beauty. The standards do three things: 1) limit the intensity of development around water; 2) create a vegetative buffer around water to protect it from adverse effects of development; and 3) preserve wetlands by limiting activity to agriculture, recreation and other open space uses. The Shoreland Zone is an area within 1000 feet of a lake or 300 feet of a stream, or the landward side of its floodplain, whichever is greater.

All waterways in the project area have a shoreland zone, and all wetlands greater than five acres in the shoreland zone generally are protected by local ordinance. Department of Transportation projects however are exempt from local zoning.

Surface Water Drainage
Local drainage basins were estimated using topographic maps with a 2 foot contour interval. The project area includes six local drainage areas shown on Figure 4. Three have surface runoff directly to the mainstem of the Milwaukee River and three drain first to smaller tributaries – Wingate Creek, Airport Creek, and Kudek Creek. The local drainage basins are used to group hydrologically related wetlands and to estimate the effects of land use patterns on individual waterways.

Land Use
Land use in the Town of Trenton is mainly in agricultural and open space uses. Between 1995 and 2000 the main shift has been from agriculture to residential development and related local road construction.

A land use feature closely correlated with stream water quality is the amount of impervious cover within the drainage basin of that stream. Impervious cover means paved roads, parking lots, rooftops, or any surface which causes water to runoff completely with no infiltration. Direct measurement from air photos is the best way to estimate impervious cover, however it is time consuming. For this study, we estimated impervious cover by using the county average percent impervious cover for each land use category. The average percent impervious cover for each category is based on direct measurements for a random sample of each land use category within Washington County. This average percent impervious cover by land use category is listed in Appendix 2.

Figure 5 shows year-2000 land use within the Town of Trenton and within each tributary drainage basin and the estimated percent impervious cover for each basin.

FUNCTIONAL ASSESSMENT

Functional values of wetlands with a high degree of interaction are considered together and ranked as a unit. In Table 1 each unit appears as a uniform color band. Hydrology and ecological connection are the major factors in grouping wetlands into functional units. Units are divided if they are geographically isolated or where water volume, source, flow or velocity changes significantly. Wetlands that form a patch work in the landscape, for example small wetlands within the same forest patch or soil map unit, or those that are separated by relatively small non-wetland areas are grouped for the purpose of evaluating functions.

Wetlands are grouped without regard to property lines or political boundaries, and without regard to physical barriers, unless the barrier is so significant as to affect wetland functions. For example, wetlands up and downstream of a culvert or wetlands on opposite sides of a stream are evaluated as one unit. Each wetland group may include more than one plant community type.

Each wetland unit is evaluated based on DNR's Rapid Assessment Methodology for Evaluating Wetland Functional Values (Siebert, 1992). The functional value scale for each function of each wetland unit is "Low", "Medium", "High", or "Exceptional".

How the various factors contribute to each functional value ranking is explained below, and the results for all wetland units are listed in Table 1. No wetland units within the project area received an "Exceptional" rank for any function. This score typically is reserved for functional values provided by wetlands of the highest quality, for example those within State Natural Areas or of statewide or national significance.

A brief narrative that describes each individual wetland unit and a summary of its functional values is in Appendix 1.

WETLAND FUNCTIONAL VALUES

Floral Diversity

Floral diversity is ranked "High" where there are a large number of native species, especially species that are rare, or where the plant community as a whole is regionally rare such as mature forests, bogs or fens. Floral diversity is ranked "Low" where there are few species and the non-native, often invasive, species dominate.

The Floristic Quality Assessment Method affords a consistent way to compare sites once the method is calibrated within a region to determine what range of values are associated with the full range of natural communities. While C values largely indicate a species' affinity for a particular habitat type, they may be used cumulatively, within the context of an FQI value, to compare particular sites in an ecoregion. Testing in Wisconsin is not complete. Preliminary data suggest, however, that areas with low floristic quality typically have mean C values less than 3 and FQIs less than 20, while high quality natural areas typically have mean C values greater than 4 and FQIs greater than 30.

Floristic quality is not strictly synonymous with floral diversity. For example, different community types naturally have higher or lower species diversity, and so a single scale for mean C values or FQIs is not uniformly applicable to all community types. An undisturbed shallow marsh typically has lower floristic diversity than an undisturbed wet meadow. DNR uses the Floristic Quality Assessment however as a starting point for a floral diversity score. Where the C value and FQI are near a break point the type of community and the individual species are taken into account.

Some wetlands are more likely to include species that were not apparent during the single field visit. Since non-persistent species tend to be the more conservative, the estimated FQIs in these wetlands are assumed to be low.

No Federal or State-listed Threatened or Endangered Species were observed in the project area. One State Special Concern species, Butternut (*Juglans cinerea*), was observed. Eight species listed by SEWRPC as Uncommon were observed: Dutchman's breeches, (*Dicentra cucullaria*), Water avens (*Geum rivale*), Swamp saxifrage (*Saxifraga pensylvanica*), Sweet flag (*Acorus calamus*), Hair beak-rush (*Rhynchospora capillacea*), Brome-like sedge (*Carex bromoides*), and Wood reed grass (*Cinna arundinacea*).

Wildlife Habitat

All wetlands provide some wildlife habitat. Wildlife habitat is ranked "High" in Class 1 Wildlife Habitat areas; in mixed-Class areas contiguous to Class 1; in Class 2 or 3 areas within mapped environmental corridors or that contain waterways of high biological value, such as those that support sport fish or amphibian populations. Wildlife habitat is rated "Low" if the area does not qualify for a Wildlife Habitat class or is Class 3 with a single cover type dominated by lower quality vegetation.

The Town of Trenton is entirely within a priority area for the U.S. Fish & Wildlife Service North American Waterfowl Management Plan. The goal of the plan is to return waterfowl populations to levels of the mid-1970's through restoring and protecting wetland and grassland habitat. In priority areas the Plan funds qualifying projects on private lands through voluntary landowner participation.

Volunteer members of the Riveredge Bird Club conducted point count bird surveys weekly from March through June, and again from August through October 2003. Appendix 3 lists the species observed at each of five sampling points in the project area. Site 104 is along the river corridor east of the airport in Berth Woods. The remaining sites are north of STH 33 and east of Oak Road.

Appendix 3 indicates the species' status in the Wisconsin Natural Heritage Inventory, the Partners in Flight Bird Conservation Plan (Knutson et al., 2001) and the current US Fish & Wildlife Service Resource Conservation Priorities (USFWS, 2002). The species are in three groups: 1) Breeding Species, those which are known to breed in the general area based on this survey or previous observations; 2) Potential Breeding Species, those that may breed here, but for which there is no local record; and 3) those that are certainly migrants.

Forest species of note are the Wood thrush, Canada warbler, and the State Threatened Acadian flycatcher, all of which are uncommon and declining. The State Threatened Henslow sparrow nests in dense grasslands. The Blue-winged warbler is a shrub species.

Randy Hetzel, private wildlife biologist, conducted wildlife surveys during 2003 and documented many of the same bird species, along with small mammals, common garter snakes, painted and snapping turtles and most amphibians known to occur in the region. The project area includes the documented range of the State Threatened Blanding's turtle and Butler's gartersnake, and contains suitable habitat for both species, but neither species was observed.

The survey report is currently a draft but does not appear to rule out the presence of either Butler's Gartersnakes or Blanding's Turtles. For Butler's Gartersnakes the survey indicates that only 5 days of cover object surveys were conducted during the recommended period (May 1 through July 15). Generally, a minimum of 12 days is required to conclude presence or absence with reasonable confidence. For Blanding's Turtles the extended drought left fewer ponds with water and so favored locating turtles of all kinds. The trapping however occurred in September. Mid-spring, once the turtles come out of hibernation, is a more effective trapping period. Without additional data, both species will require further surveys before DNR can conclude absence.

Fishery
Wetland functional value for fisheries is ranked where wetlands buffer a stream or where a wetland is isolated but large enough to support a fish population. Where there is no wetland-stream connection or the wetland is isolated from a stream and too small to support fish itself, the wetland functional value for fisheries is Not Applicable (NA).

The rank is "High" if the wetland is connected to streams known to support cold water species, warm water sport fish or forage fish that are intolerant of pollution. The rating is "Low" if the wetland is connected to streams with fish communities limited to tolerant forage species. Factors that reduce the fishery value of a wetland are effective obstructions to fish passage between the stream and the wetland, such as dams or improperly installed culverts, or natural limitations such as low flow or insufficient depth.

Woody material is a limiting factor for the fishery in the Milwaukee River. The river is low gradient and so lacks much coarse substrate for aquatic organisms' cover and resting areas. Large scale clearing of woods for agriculture has eliminated the natural woody debris in streams that serve the same functions as coarse substrate. Woody material is also the major carbon source at the base of the aquatic food chain. For these reasons, riparian wetlands with woody vegetation have high value for the fishery.

Shoreline protection
Shoreline protection is rated where wetland vegetation buffers a stream. Where there is no wetland-stream connection shoreline protection is rated Not Applicable (NA).

A shoreline protection rank is "High" where the buffer has densely rooted plants and is wide enough so that the upper bank is stable. This is generally where the buffer width exceeds 50 feet and is relatively continuous. A shoreline protection rank is "Low" where the buffer is less than 10 feet wide or covers only a small percentage of the stream length.

Flood and Storm Water Attenuation
All wetlands provide some flood and storm water storage and attenuation. This functional value is ranked "Low" where wetlands are small *and* isolated from waterways. Wetlands with a waterway connection have an important flood and storm water attenuation function if they are large enough relative to their tributary area to store water during significant storm events. For example small sites that would fill to capacity and overflow before a major storm event do little to reduce flooding downstream. Larger sites with more capacity can have a greater effect. In this region a ratio of tributary drainage area to wetland area greater than 20:1 indicates the wetland's storage effectiveness is low for major storm events. As the ratio approaches 10:1 that effectiveness is very high.

Wetland size based on project area alone can appear to be a confounding factor in the ranking. A small area of a large wetland complex may not provide much attenuation, but cumulatively small areas may provide substantial attenuation. To account for cumulative effects, small areas of a larger wetland important for flood and storm water attenuation are ranked high. Wetland size is taken into account in evaluating the effects of the project.

Other factors that contribute to flood and storm water attenuation are the wetland's configuration, flow path, vegetation type and density. Where these tend to reduce water velocity and increase retention time the wetland's flood and storm water attenuation value increase. For example, a sedge meadow with a braided flow path will contribute more toward flood and storm water attenuation than a channelized wooded wetland of the same size.

Water Quality

Most wetlands provide water quality benefit. This functional value is ranked "Low" where wetlands are small and isolated from other surface water. The functional value is ranked "High" where the wetland receives stormwater runoff as a primary water source, that runoff has the potential to deliver considerable nutrient or sediment loads, and the wetland has a sufficient retention time to reduce the load before it discharges to other surface waters. As with the flood and storm water attenuation function, the rating considers the entire wetland, not just the portion in the project area.

Greater retention time means more time for sediment and pollutants to drop out of the water column, and for excess nutrients to be transformed and removed. Factors that increase a wetland's retention time are the same as those described above for storm and flood water attenuation: wetland size, configuration, water flow path, vegetation type and density.

Wetlands downslope from agricultural or urban lands are assumed to receive runoff with sediment, pollutants and excess nutrients, and to protect water quality. Urban runoff tends to have more severe effects on water quality than that of agricultural land. Once impervious cover reaches about 10 percent of a drainage basin, water quality generally declines. Typically, stream channels show signs of instability, and the diversity of aquatic species decreases as species that are more intolerant of chemical and thermal pollution are lost from the system. Once impervious cover exceeds about 20 percent within a drainage basin, the waterways are mainly conveyance channels that support only the most tolerant aquatic life (Center for Watershed Protection, 2003).

Wetlands that are in a position to affect water quality and that are also in drainage basins compromised by impervious cover are especially valuable. Land use in the Kudek Creek drainage basin is similar to the average for the Town of Trenton, with over 80 percent of the land in agriculture and open space. Wingate and Airport Creek drainage basins are much more urban with 16 and 14 percent impervious cover respectively.

Groundwater

The geology in the project area is dominated by glacial lake deposits (Young and Batten, 1980). Glacial lake deposits are typically composed of sand, silt and clay derived from melting glaciers and laid down in fresh water lakes. The area north and east of West Bend is one of the major glacial lake deposits in southeastern Wisconsin. The southern boundary of the deposit is the Milwaukee River. The northern boundary extends toward Wallace and Green Lakes. Lake deposits in the study area are mainly pitted outwash and other ice-contact deposits, laid down by water from melting ice fronts before the Milwaukee River drained through the area, and are composed of sand and/or gravel. The formation is important for local groundwater recharge and base flow to streams tributary to the North Branch and the mainstem of the Milwaukee River.

Because of these deposits, much of the project area has soils that are moderately to rapidly permeable. Well Construction Reports from 86 wells for Sections 8, 9, 16 and 17 in the Town of Trenton were reviewed and used to estimate stratigraphic cross sections. The data indicate the permeable material (sand and sandy clay) extends vertically to intersect the groundwater before reaching any heavy clay and the coarse material is laterally continuous. Depth to bedrock in the north ½ of Section 8 is 377 to 437 feet based on construction information from 14 wells. The upper-most bedrock unit is shale. Most area wells use the upper sand and gravel aquifer.

These permeable deposits increase the hydrologic connection between the wetlands and groundwater. Water can either discharge from below the surface into wetlands and other surface waters, or it can recharge the groundwater by passing through permeable soil layers. Wetlands formed in or overlying soils that are relatively permeable experience a combination of discharge and recharge. They receive groundwater during periods of high water and recharge shallow groundwater during drier conditions.

Slope also contributes to the extent of groundwater recharge since flats and depressions allow the water more time to infiltrate rather than run off the surface. Where wetlands occur on slopes over permeable soils, they are generally groundwater discharge areas since only groundwater can supply the constant water source. One example of this wetland type is the calcareous fen in Plant Community Area 3. Another more common example is the groundwater flow to streams that supplies water between storm events.

Figure 6 shows the wetlands relative to the limiting permeability of the underlying soil based on tabular data from the Wisconsin Soil Survey Database (USDA, 1999). Limiting permeability is the saturated hydraulic conductivity of the least permeable layer of all the layers of all components of a given soil map unit. For example, average permeability of Granby fine sandy loam is 4 cm/hr in the first 20 inches, and 13 cm/hr from 20 to 60 inches below the surface, so the conductivity of the least permeable layer is 4. Wetlands over strata of higher limiting permeability are more likely to affect and be affected by groundwater than wetlands over less permeable layers.

Field observations during wetland boundary delineations indicate that soils in the project area have generally higher permeability than the average map unit values. Therefore the soil database values, and Figure 6, underestimate the extent of wetland – groundwater interaction.

The groundwater recharge or discharge function was ranked by considering limiting permeability as well as soil type, slope, and vegetation indicators. Where at least three factors indicate a strong wetland-groundwater interaction, this function was ranked "High". Where there are fewer indicators, or where indicators are inconsistent, this function is ranked "Low" or Unknown. If observations indicated that either groundwater recharge or discharge was dominant, that information is included in the narrative descriptions in Appendix 1.

Aesthetics, Recreation, Education
This functional value considers a combination of accessibility, and the potential for scenic value, recreation, education and scientific study.

Examples of factors related to accessibility are: visibility from vantage points, such as public roads, public lands, homes, and businesses; direct access from roads or water; location near a population center, or public or conservation ownership.

Wetlands in the project area considered accessible are: 1) those adjacent to the Milwaukee River; those visible from STH 33 and its side roads; 3) those associated directly or indirectly with Natural Areas and critical species habitat; 4) those visible from the golf course and other lands open to the public.

Some factors related to scenic value are the extent of long views, natural contours, or variety and complexity in color and texture compared to the surrounding landscape; and the extent of obvious human influence such as structures or trash.

Summary
The project area includes about 258 wetland acres. As indicated in Table 1 most of the wetlands provide the full range of wetland functional values protected by State water quality standards for wetlands, NR 103, Wis. Adm. Code. Others, due to their landscape position, provide a subset of functional values. The degree to which each wetland area provides each functional value varies from High to Low. Taken as a whole the functional values of the wetlands in the project are significant for their contribution to water quality in the Milwaukee River Basin.

The proposal and specific design elements will determine potential effects on wetland functional values and water quality. The significance of adverse impacts will depend on the location and extent of direct wetland loss within the project area; and on the location, extent and nature of indirect effects on wetlands and water quality within and associated with the project area.

Wetland water quality standards are met if: 1) there is no practicable alternative that avoids adverse impacts to wetlands; 2) all practicable measures to minimize adverse impacts to wetland functional values have been taken; and 3) considering compensatory mitigation, there is no significant adverse impact to wetland functional values, significant adverse impacts to water quality, or other significant adverse environmental consequences. Adverse impacts include both direct and indirect impacts.

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ATTACHMENTS

Table 1. Plant Communities, Wetland Functional Value Factors and Ratings

Figure 1. Project Area and Areal Extent of Wetlands

Figure 2. Adopted and Planned Environmental Corridors

Figure 3. Wildlife Habitat, Natural Areas and Critical Species Habitat Areas

Figure 4. Hydrography, Floodplain, Floodway and Local Drainage Basins

Figure 5. Land Use and Impervious Cover

Figure 6. Limiting Soil Permeability

Appendix 1. Summary of Plant Communities in the Project Area:
Wetland Description and Functional Value Summary
Plant Community Area Species Lists (SEWRPC Exhibit A)
Field Data Forms (SEWRPC Exhibit B)

Appendix 2. Land Use Codes and their Estimated Percent Impervious Cover.

Appendix 3. Summary of the 2003 Point Count Bird Survey.